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09/691,406	10/17/2000	Christopher Hoover	21891.02500	3943
7590 04/07/2004				
John W. Carpenter CROSBY, HEAFEY, ROACH & MAY P.O. Box 7936 San Francisco, CA 94120-7936				
EXAMINER CHANG, SUNRAY				
ART UNIT		PAPER NUMBER		
2128		9		
DATE MAILED: 04/07/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/691,406

**Applicant(s)**

HOOVER, CHRISTOPHER

**Examiner**

Sunray Chang

**Art Unit**

2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on 17 October 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☐ Claim(s) \_\_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 October 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 7, 8.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

2. Claims 1 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Lavagno et al. (HW/SW Co-Design for embedded Systems, 1998 and referred to as Lavagno hereinafter).

3. Regarding independent claims 1 and 15, Lavagno teaches In a system-level design and integration system (System level issues, Line 12, Page 2) which facilitates composing behavior (CFSM Behavior, Line 1, Page 5), capturing architecture and mapping behavior onto architecture (SW+HW architecture definition and mapping, Line 8, Page 13), a method for specification of scheduling for simulation and implementation of consumer embedded systems (HW/SW Co-Design for Embedded Systems, Line 1, Page 1); the method comprising the steps of: a) identifying the schedulers in an architecture (architecture selection CPU, scheduler ..., Line 9, Page 9); b) identifying the schedulables constituting behavior (HW partitions 1 and 2, Page 8); c) assigning schedulables and schedulers to each other (e2, e3, e4, Page 8); d) arranging for the schedulers to find their respective assigned schedulables (e2, e3, e4, Page 8); e) arranging for the schedulables to find their respective assigned scheduler (e2, e3, e4,

Page 8); f) sending an event to a schedulable (Detect input events, Line 4, Page 5); g) sending an activation notice from the schedulable in step f) to its assigned scheduler (Scheduling, validation, Page 11); h) sending a message from the assigned scheduler of step g) to the schedulable of step f) to start its behavior's reaction (behavior annotated with architectural effects, Page 15); and i) sending a finish notice from the schedulable of step f) to the scheduler of step g) when said reaction is completed (Testing, validation, Page 11).

4. Claims 1 – 28 are rejected under 35 U.S.C. 102(a) as being anticipated by Balarin et al. (POLIS A design environment for control-dominated embedded systems version 0.4 User's Manual, Nov. 10, 1999 and referred to as Balarin hereinafter).

5. Regarding independent claims 1 and 15, Balarin teaches In a system-level design (POLIS design, Fig. 7, Page 32) and integration system (Board Level Prototyping, Fig. 7, Page 32) which facilitates composing behavior (system behavior, Fig. 7, Page 32), capturing architecture and mapping behavior onto architecture (Partitioning, Fig. 7, Page 32), a method for specification of scheduling for simulation and implementation of consumer embedded systems (POLIS, Fig. 7, Page 32); the method comprising the steps of: a) identifying the schedulers in an architecture (Scheduler Template + Timing Constraints, Fig. 7, Page 32); b) identifying the schedulables constituting behavior (System Behavior, Fig. 7, Page 32); c) assigning schedulables and schedulers to each other (SW Synthesis, HW Synthesis, Fig. 7, Page

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32); d) arranging for the schedulers to find their respective assigned schedulables (C-code, Fig. 7, Page 32); e) arranging for the schedulables to find their respective assigned scheduler (OS, Task, Logic Synthesis, Fig. 7, Page 32); f) sending an event to a schedulable (Unoptimized HW, Fig. 7, Page 32); g) sending an activation notice from the schedulable in step f) to its assigned scheduler (OS Synthesis, Fig. 7, Page 32); h) sending a message from the assigned scheduler of step g) to the schedulable of step f) to start its behavior's reaction (simulation, Fig. 7, Page 32); and i) sending a finish notice from the schedulable of step f) to the scheduler of step g) when said reaction is completed (C-code, Fig. 7, Page 32).

6. Regarding dependent claims 2 – 6, and 16 – 20, the claims has been rewrite by examiner to be as following: The scheduler determines reaction of schedulable need to be preempted or not. Halting, resuming the schedulable by sending schedulable messages if reactions need to be preempted.

Balarin teaches, Time elapses only when control reaches a halt or awaits statement. At that point, the CFSM transition is completed, including state update and output event emission for that transition, and the CFSM goes back to its idle condition, waiting for the next set of events that will wake it up and (possibly, i.e., if they are being explicitly awaited in that idle state) cause the next transition to occur. (Line 2 – 6, Page 15)

for further information,

reaction of the schedulable (synthesizable subset, Line 27, Page 11),

preemption (Preemptive, Policy, Line 19, Page 59),  
non - preemption (NonPreemptive, Policy, Line 22, Page 59),  
suspend message (event, Line 19, Page 59),  
temporarily halt the reaction (await, halt, Line 4, Page 75),  
activation notice (task activation, Line 27, Page 26),  
behavior's reaction (reactive behavior, Software Synthesis, (a)CFSMs. Page 31)

7. Regarding dependent claims 7 and 21, claims has been rewritten by examiner to be as following: scheduling the behaviors of schedulables based in part on the priorities of mapping assignments of said schedulables.

Balarin teaches (Line 38, Page 24 – Line 6, Page 26) generally the execution policy is priority-based, in that one among the set of ready tasks is dynamically chosen according to a priority order. Priority, intuitively, is a measure of “urgency” of each task, and can be determined, in turn

- (a) statically at compile time, or
- (b) dynamically at run time.

Moreover, dynamic scheduling can be

- (a) pre-emptive if the currently executing task can be suspended when another task of higher priority becomes ready,
- (b) non-pre-emptive otherwise.

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8. Regarding dependent claims 8 – 11 and 22 – 25, claims have been rewritten by examiner to be as following: steps are carried out with a (cyclo-static, non-preemptive static priority, preemptive static priority, selected scheduling) policy.

Balarin teaches a particular scheduling policy (task ordering, priority assignment,...) (Line 33, Page 26)

9. Regarding dependent claims 12 – 14 and 26 – 28, Balarin teaches (Line 11 – 27, Page 59) **policy** string, the scheduling policy to be used on the resource. It is used only for software blocks, and should be the same for all stars which use the same resource. Currently supported policies are (names are case insensitive):

- RoundRobin: priorities of the stars are not considered and execution follows a sequential and circular fashion. No assumption is made on the scheduling sequence, that may be different from one run to another.
- Preemptive: stars with higher priority are executed first, in a round-robin fashion within a priority level. If a star with a higher priority than the currently executing star receives an event, then the currently executing star is suspended (i.e., preemption occurs).
- NonPreemptive: stars are executed according to their priority, but no preemption can occur.
- FIFO: stars are executed according to the timestamp of the incoming events. No priority is considered.

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- FIFOPreemptive: if the priority of two stars is the same, then they are fired according to the timestamp of the incoming input events; otherwise the priority is used and preemption can occur.
- FIFONonPreemptive: same as the previous one, but without preemption.

### **Conclusion**

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pees et al. (On core or more: A Design Perspective for System – on-a-Chip, 1997) discloses HW/SW co-design, Hardware in the simulation loop, embedded system, machine description, and hierarchical generation. Marelli (Cadence virtual component co-design (VCC) environment for engine control unit design) discloses VCC, ECU, virtual model, HW/SW co-verification and HDL simulators. Evans (Embedded software Systems – Codesign Projects, 02/21/98) discloses POLIS, CFSM, *High Level Language Translation, Formal Verification, System Co-simulation, Design Partitioning, Hardware Synthesis, Software Synthesis, and Real-time Operating System.*

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sunray Chang whose telephone number is 703-305-8744. The examiner can normally be reached on M-F 7:00-4:30. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska can be reached on 703-305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Any inquiry of a general



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nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-6833.

Sunray Chang  
Patent Examiner  
Group Art Unit 2128  
Technology Center 2100  
U.S. Patent and Trademark Office

*Thaiphon  
Thai Phan  
Patent Examiner  
AU: 2128*

April 2, 2004